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FILE: Oxcart Black Shield Meetings 25X1

OXC-9022-65
Copy 7 of 13

26 July 1965

MEMORANDUM FOR THE RECORD

SUBJECT : BLACK SHIELD Technical Meeting at [redacted] 25X1
15 July 1965.

FILE B S CORRES.

This report constitutes:

Part I - General Aircraft Items

Part II - Propulsion Items

Attachment I - Agenda

Attachment II - Decisions and Actions

Attachment III - Lockheed Charts

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Part I:

1. Lockheed has identified the [redacted] plugs used in the LAC inlet control system as a potential primary source for the recent numerous incidents of poor inlet control performance. The wire sizes to the plugs are considerably larger than the plug was intended to accommodate and consequently, are too brittle and not able to withstand the stresses resulting from bending and twisting during mating and unmating of the plugs. Numerous broken and intermittent connections have been identified. To alleviate the situation immediately, more care will be exercised in handling the plugs and wires, an effort will be made to reduce the frequency of disconnects, and the wire harnessess will be tied down firmly to eliminate vibration. The long range fix, which is now underway, is a redesign of the plugs. 25X1

2. A new technique is being used during refueling and climb out after refueling which has increased the available cruise fuel. The technique consists of refueling with

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Class 1
Excluded from automatic downgrading and declassification

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afterburner thrust on one engine and military thrust on the other engine. The military thrust engine is throttled as required to eliminate the 5000-6000 feet loss in altitude generally suffered during refueling. After refueling, the A-12 is put into a gradual dive for about 3000-4000 feet until 450 KEAS is reached after which a normal climb is accomplished.

3. Recent oscillograph data on aircraft 129 has revealed how to adjust the inlet spike control as a function of Mach number to eliminate the roughness. Some of the more recent flights with aircraft 129 and 130 have been encouraging in this particular area.

4. Aircraft 126 and 127 appear to be two weeks late in completing the modification program. A major contributor to this slippage has been the lack of modified inlet control computers. At this meeting all present were advised for the first time that all of the inlet control computers had to be returned to [redacted] for modification because of the HF interference problem. No one had previously heard of this computer modification program and all were under the impression that the HF interference problem was being solved by shielding around the HF source. Mr. Johnson's stated reason for not having kept people informed was that there was nothing anyone could have done had they known. However, both General Ledford and [redacted] offered very specific reasons as to what Headquarters could have done and why, in the future, Headquarters insisted upon being informed of any and all delaying factors.

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5. The Service Bulletin is being written for the additional cooling to the ARC-50. Indications are that the temperature will be reduced approximately 45° F. LAC is investigating a possible IRAN type of program for the ARC-50 units which have already been overheated. However, this does not seem too likely to take place because the Magnavox price quote is very excessive. A more practical approach to the problem is to exchange the suspected A-12 overheated units with units from the tankers. This would only require a mounting modification to the A-12. This approach seems reasonable since the tankers carry an onboard spare ARC-50 as a standard procedure.

6. Getting adequate cooling turbines for the air conditioning system still remains as a problem. LAC is working on an improvement but to date have no satisfactory solution.

[redacted]

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7. Additional ground cooling will be provided to reduce the number of inverter failures.

8. Almost all single engine flight testing remains to be done. Only one such test has been conducted to date. The delay has been due to the attempts to get off a successful 25X1 flight. Pratt-Whitney has increased the allowable single engine EGT to 825° C for 30 minutes duration on an emergency basis.

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ASD/OSA

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PROPULSION

Part II:

1. Engine related areas of recent flight tests on article 129:

a. Mr. Johnson described the new technique for engine power control during refueling. This involves setting one engine at minimum afterburner thrust and the other at a power setting below military with throttle adjustment of this engine as required to provide sufficient thrust to maintain a constant refueling altitude at 32,000 feet. The unaxisymmetric thrust vector is automatically corrected by the stability augmentation system. This technique avoids the previously wasted effort and loss of energy resulting from the "tobogoning" effect of beginning refueling at 30,000 feet and then losing several thousand feet of altitude during the refueling process. This technique combined with "diving through" the transonic acceleration results in a greater quantity of fuel available for cruise. Recent flights on article 129 indicated a gross weight of 100,000 lbs. when reaching cruise altitude.

b. Mr. Johnson stated that further improvement in range factor cannot be accomplished until flights are made at higher altitudes after article 129 has been equipped with the derichment system.

c. Mr. Johnson quoted recent inlet recovery and distortion numbers obtained from article 129 flight tests as 80% and 8% respectively at Mach 3.21.

d. Mr. Johnson also discussed recent experience obtained with regard to proper setting of spike position as a function of P_{PLM}/P_{SD8}. Where P_{PLM} is the local mach sensor (actually a total pressure on the outside of the cowl lip) and P_{SD8} is the static pressure on the interior of the inlet duct wall which senses position of the normal shock. An approximate facsimile of the curve as presented by LAC is shown in Figure 1.

e. In regard to [redacted] flights on article 129, Mr. Johnson stated that he wanted to conduct these flights with the engines now installed since the left engine was low in thrust and required about 2,000 pound per hour more fuel than the right engine for the same thrust output. This impression was obtained from only one flight (number 126) on which there was a SAS or rudder control problem which required only a 2,000 PPH engine full flow difference to straighten the aircraft. Later investigation showed the 2 engine RPM's to be within 30 RPM of one another at a given thrust level. On flight 128 with the same two engines, fuel flow indications on both engines during cruise were identical at 13,000 PPH. 25X1

2. An additional item of engine performance raised by Mr. Johnson concerned reference to a reduction of 8,000 lbs. of excess thrust in the area from Mach 2.3 to 3.2 which was attributed to the effect of the rapid opening of the engine internal bleed bypass doors. The actual cause of this excess thrust deficiency is difficult to determine since it is in this same Mach number range (2.3 to 3.2) that climb KEAS are shifted from 450 to 400 and inlet system bypass doors shift position. Published P&W performance data (PWA FR 1127) on Y engines with J afterburners show a maximum possible effect of the bleed doors opening of 200 lbs. of thrust per engine.

3. The question of where (in which aircraft) flight testing should be done on the 34½ K engine was raised and General Ledford suggested that this should be accomplished in aircraft 121 with 129 continuing its current flight test program as long as needed.

25X1 4. [redacted] of LAC reviewed engine aspects of the flight test programs on articles 122 and 129.

a. One single engine flight has been performed so far with most of this testing still remaining to be completed; about four or five additional flights are required. The single engine testing has now been

delayed until after completion of the planned [redacted] 25X1
25X1 [redacted] flights on article 129.

b. More air restart testing with the modified TEB (24 shot) system will also be done after [redacted] 25X1
25X1 [redacted] flights on 129.

c. Recent article 122 flight testing has included testing of the frosty HSD control and testing of the derichment system. Tests to date of the derichment device appear satisfactory enough to merit installing derichment devices on engines as they become available.

d. J engine roughness testing on article 122 was considered complete after the problem was determined to have been caused primarily by the particular windmill bypass valve which had been installed on engine 305, when the roughness complaints first developed.

5. Pratt & Whitney [redacted] gave a chart 25X1
supported presentation of current engine status and items of BLACK SHIELD interest.

a. The average status of Y engines for the period 1 January 1965 to 30 June was quoted as 22 installed engines, seven ready spares, 13 in field engine shops and 13 at overhaul.

b. The programmed plan for equipping engines with desired features for BLACK SHIELD indicates the following numbers of engines will be so equipped at the end of a given month: July, 31; August, 36; September, 42; October, 47; November, 52; December, 55.

c. Expected delivery status of J afterburners for Y engines indicates the following total deliveries at the end of a given month: July, 27; August, 32; September, 35; October, 39; November, 43; December, 48; January, 52; February, 55.

d. "Frosty" HSD controls are expected to be available for the following numbers of engines at the end of a given month: July, 17; August, 22; September, 27; October, 32; November, 37; December, 42. Ten Y engines
25X1 are equipped with [redacted] main fuel controls.

[redacted] 25X1

e. Recent "no trim" flight testing of engine 215 in article 122 with a Frosty control (flights 108-114) were reviewed. Trace data indicates that the droop problem on the Hamilton control is corrected by the Frosty fix and repeatibility is much improved. However, the scatter of the data (EGT vs. CIT) covers a broader band than the normal EGT trim band at cruise and tends to indicate that the final solution to optimum EGT scheduling will be the auto trim device now being developed. P&W recommends that when manual trimming is required, that EGT be trimmed only to the near side of the cruise trim band (i.e., Trim down to 805° C when the control indicates a tendency to over temp. and trim up to 755 when the control indicates a tendency to under temp) the pilot should not attempt to trim to nominal EGT (780° C) and this procedure is expected to minimize tendency of pilot to "chase the control" and over-react to trim requirements. When this procedure has been verified by BLACK SHIELD test flights with over-the-shoulder cameras installed and the pilot describing his trim procedures into the voice recorder, the engine SOI (Standard Operating Instruction) manuals will be revised accordingly.

f. At the time of this meeting, derichment devices were installed on engines 257(Bx) and 215 (HSD) in article 122 [redacted] and engines 209 (HSD) and 227 (HSD) in article 127. Aircraft derichment kits were installed on articles 121, 122, 126 and 127. Two derichment devices for [redacted] control equipped engines are being sent to EAFB for a flight test RS-71. These six sets represent the total current compliment. However, P&W has "scrounged up" enough parts in Florida to provide two additional sets of derichment hardware which should have been delivered to [redacted] by this time.

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g. A general discussion developed over the status of TEB systems and the objective of the current tests with the 24 shot system was reiterated. (i.e., that the 24 shot system with the reduced volume per shot will guarantee that the current 12 shot system is capable of providing 16 shots equal to or greater than the volume and therefore ignition energy of the 24 shot system.) A discussion developed over the possibility of providing the pilot with a TEB shot counter and the status of this system is being checked further.

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25X1 h. The status of the main gearbox inspections was reviewed by [redacted] The need for this inspection results from a main gearbox gailure in engine 219 on 23 April 1965. The vibration check is now being used as to "go - no go" check for detecting impending bearing distress and 34 gear boxes have now been checked by this technique. Four have been rejected as having a vibration amplitude greater than the specified limit of .0001". Of the four rejected gearboxes, two have been examined in detail with one showing no distress and the other had experienced some minor bearing pitting which wasnot considered serious. P&W is now considering raising the limiting amplitude to .00015" based on the experience to date. The retrofit to increased bearing clearances on both idler shafts in the main gearbox will be continued.

i. J engine roughness testing on article 122 was reviewed and it has been ascertained that the serious roughness complaints resulted from one windmill bypass valve which apparently experienced an interaction with a high hysterisis pressure regulating valve in a [redacted] 25X1 main fuel control.

j. A general discussion was held on the engine supply and overhaul status. Four of the "limited capability" engines remaining in the field have recently been returned to overhaul with only three remainingin the field. These engines have been used primarily as so called vacuum cleaner engine and have not been equipped with latest fixes such as shimmed first stage compressor blades and heavy second discs. The anti-FOD screens which are intended to eliminate the need for the vacuum cleaner engine practice were found to have an interference with the article inlet at the ID, requiring an adapter revision and will be tested in Florida by the end of July. The objective of the Florida testing is intended to assure that the FOD screen represents an integral design and will not itself cause FOD.

k. Recent parts delay problems at overhaul were discussed including seventh and eighth stage compressor spacer delays due to a vendor strike, turbine disc delays due to a more stringent control of grain size, and difficulties in balancing engine rotors within specified engine vibration limits. Overhaul turnaround times were

quoted "a little over three months". The new overhaul facility which is intended to increase capacity to 12 engines per month is now expected to be available by 15 August 1965 which represents about a nine month availability from go-ahead date. This availability date has been delayed somewhat by a sheet metal strike. [redacted] stated that they (P&W) are making every effort to stay on top of the overhaul situation and this effort includes a weekly meeting with [redacted]

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6. General Ledford requested that Headquarters, Materiel Division, review the engine supply and overhaul picture to see how the "pipeline" compares with the predictions made during last review.

25X1 7. [redacted] of P&W also gave a brief review of monthly Mach 3 flight time. A chart covering this subject is attached as Figure 2. Copies of other charts as presented by P&W are available in D/TECH/OSA.

8. Engine Contractor representatives present at the meeting were [redacted]

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SIGNED

[redacted]

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ASD/OSA

[redacted]

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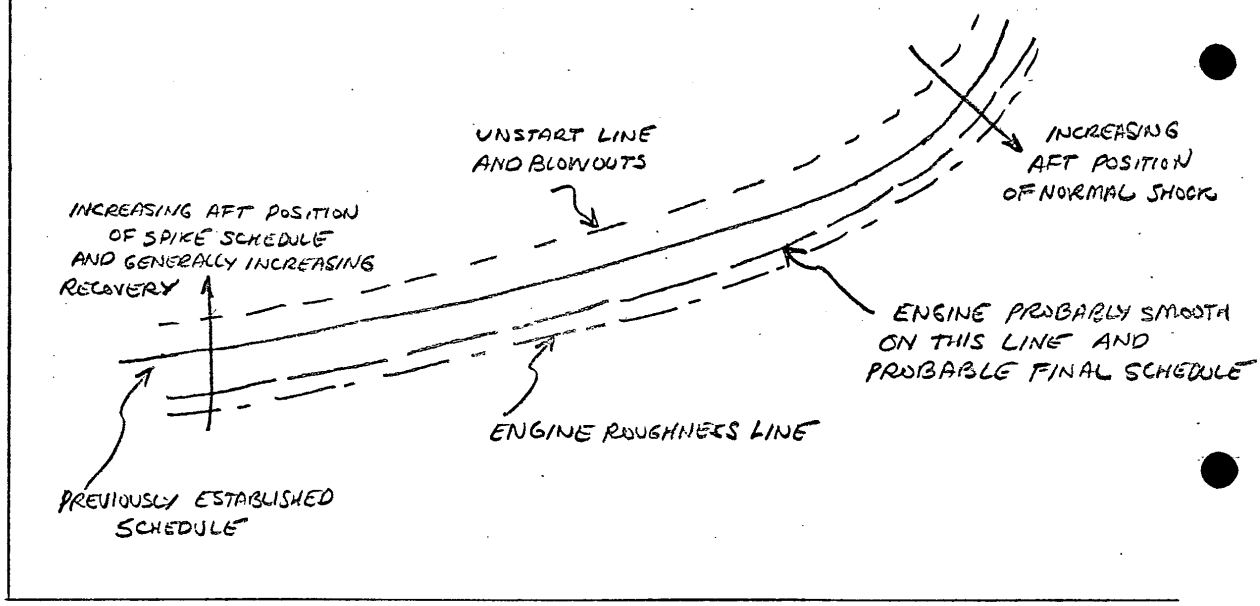
NACELLE TOTAL TO SHOCK POSITION STATIC PRESSURE RATIO
VERSUS
MACH NUMBER



$\frac{P_{PLM}}{P_{S08}}$ ↑

→ MACH NUMBER

FIGURE 1

FIGURE 1

MACH 3.0 TIME (NOT CUMMULATIVE)

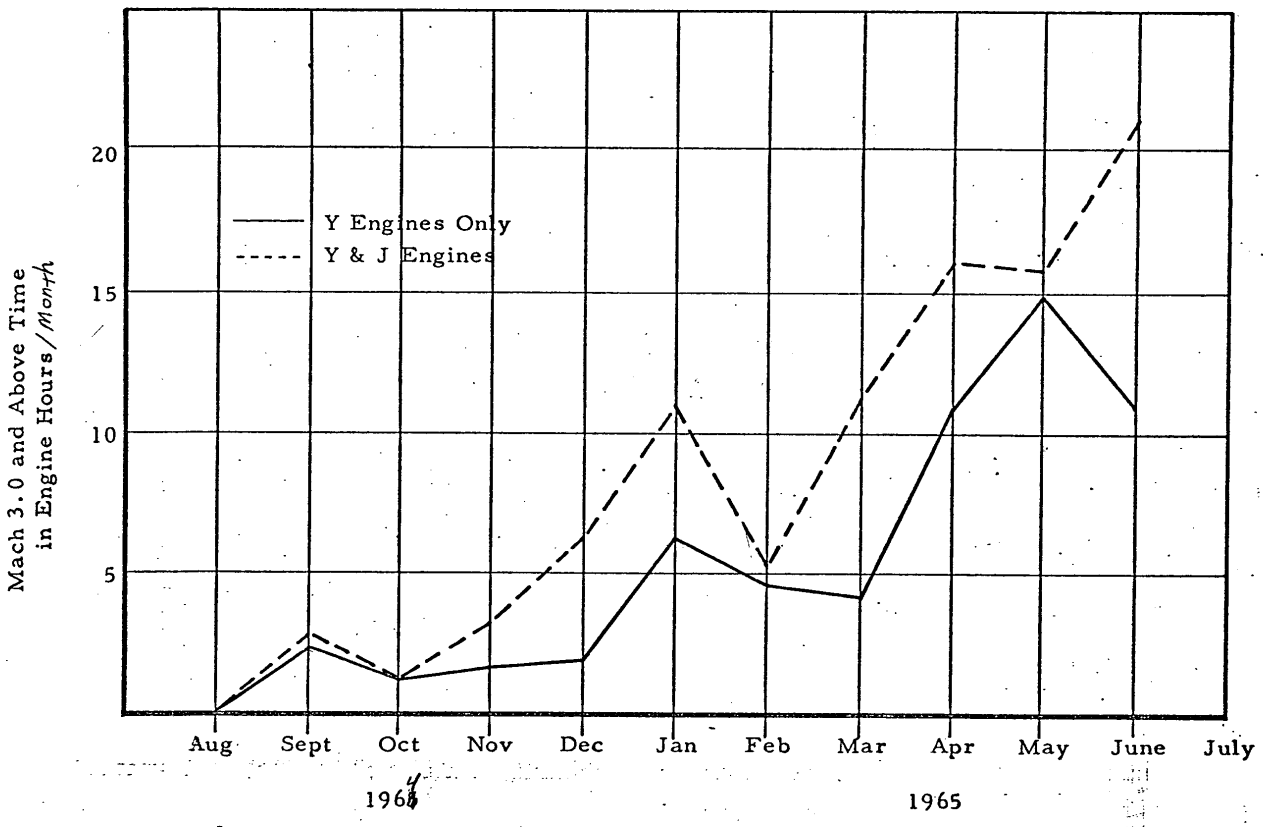


FIGURE 2

FIGURE 2

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AGENDA 15 JULY 1965

BLACK SHIELD MEETING

General Ledford: Opening Remarks (0900)

1. Lockheed: (0910 - 1015)

   A. BLACK SHIELD Aircraft Problems - Corrective Actions
   B. Inlet Control Problems - Corrective Actions
   C. Modification Status/Slippage - Corrective Actions
   D. Inlet Controls Deliveries, Shortages; Spares Support
   E. Ham-Standard Inlet Controls Status, Inventory, Back-up Planning
   F. Standby Attitude Gyro Status
   G. Airframe Interface Problems - Electrical Malfs, "Q" Bay Environment
   H. Flight Test Progress

2. Pratt & Whitney: (1015 - 1115)

   A. "Frosty" Fuel Control/ EGT Trim Experience, Status
   B. Derichment Device Experience, Status
   C. Modified TEB Ignition Relight Experience
   D. BLACK SHIELD Engine Configuration Status
   E. Engine Field Management - Overhaul, HSI
   F. Main Gearbox Status
   G. J Engine Roughness Evaluation Findings

3. Review 10 June Meeting Action Items - Attached (1115 - 1145)

4. BLACK SHIELD Flight Test Support Progress (1145 - 1230)

5. BLACK SHIELD Aircraft Experience, Validation Reporting System, Proposed Flight Committee, Scotch Mist Status (1330 - 1500)

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Attachment II

DECISIONS AND ACTIONS

1. The following represents decisions and actions resulting at the 15 July BLACK SHIELD meeting at [redacted] 25X1 It is expected that these decisions and actions will be followed and/or implemented by the appropriate parties concerned:

a. Aircraft 129 will be kept out of the modification program for approximately one month beyond its previously scheduled time for entering the modification program.

b. The 34K engine will be installed in aircraft 121.

c. Further discussions between [redacted] and Headquarters will be held prior to a decision regarding the use of the INS platform for the primary attitude indicator. 25X1

d. LAC will expedite the incorporation of SB915, isolation of ARC-50 induced power transients affecting the payload.

e. LAC will increase their effort to obtain switches for SB931, suppression of power transient effects on the INS.

f. In addition to the weekly report covering BLACK SHIELD Flight Test status, [redacted] will submit a wire to Headquarters assessing the total status to date vs. requirements of the flight test programs in support of BLACK SHIELD as outlined in paragraph 2, Headquarters message No. 1175 dated 7 July 1965. 25X1

25X1 g. The [redacted] stated that the periscope forward looking modification is not mandatory to a BLACK SHIELD mission.

h. LAC considers the rewiring of the number 2 INS needle mandatory to BLACK SHIELD.

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Attachment II

i. Lockheed to forward message to Headquarters amplifying return to vendor of inlet control computers necessitated by HF interference.

j. Derichment wiring to be installed in aircraft 129 as soon as feasible after next [redacted] 25X1

k. Headquarters, Materiel Division will review the engine supply and overhaul picture to see how the "pipeline" compares with predictions made during last review.

Approved For Release 2006/01/30 : CIA-RDP71B00399R000600120020-9

LAC INLET SYSTEM COMPONENTS

SCHEDULE		127	128	125	Start Spares
Computer	Old Cams No HF Fix	7/15	x	x	x
	Production	7/21	7/29	8/21	9/1
Door Actuator		Inst.	7/26	8/30	9/13
Spike Actuator		Inst.	7/21	8/30	9/13
Angle Transducer		Inst.	7/21	8/21	9/13
Pressure Ratio Transducer		Inst.	Inst.	Avail.	8/1

Notes:
1. 126, 130 and 131 Satisfied, with 131 Using 130 Prototype Spares.
2. Door and Spike Actuator Interchangeable with R-12.
3. Computer and Angle Transducer Convertible in Two Weeks.

Att. III

LAC PROTOTYPE INLET SYSTEMS

	129, 130, 131 Removals Since May, 1964	Spares (Ship Sets)
COMPUTER	3	1
DOOR ACTUATOR	12	1½
SPIKE ACTUATOR	6	1½
ANGLE TRANSDUCER	1	2
PRESS. RATIO TRANSDUCER	12	2

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Att. III

HSD INLET SUPPORT

For Six* Airplanes (A-12 and AF-12)

122, 134 132, and 1001, 1003	Installed	Updated Spares	In Work at Vendor	At BW-2 or Redundant Spares	Total
Main Control	12	3	9	8	32
Spike Actuator	12	9	6	5	32
By-Pass Actuator	14*	8	5	5	32

*124 Uses Two Bypass Actuators

Att. III

Modified Aircraft - Flight Problems

Detachment Flights - (6) in 131 and (1) in 130

Inlet Systems and Related Elec.	1. Door "not open" switch failure (eliminated). 2. Door actuator malfunctions - wiring and connectors.
Engine	1. Tight throttle rigging 2. Nozzle flux
Hydro	1. Hydro transmitter sticking
Fuel	1. Pump discharge fitting leak (loose) 2. Float switch sequencing - tank 3 and 4 switches being raised.

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Att. III

STANDBY ATTITUDE GYRO

Prototype borrowed from manufacturer 7-8-65

Delivered to [redacted] 7-9-65

Installed in a/c # 132 7-10-65

First flight 7-12-65 - Operation satisfactory
Pilot reaction generally favorable.

Features

1. Unit is case contained - gyro, controls, etc., built into indicator case.
2. Indicator mechanically coupled to gyro gimbals - provides 10 - 12 minutes "drift down" after complete power loss.
3. Self erecting - no controls - no attention required.
4. One unit - 6.9" x 2.38" x 2.38" (38.4 $in.^3$) - Weight $< 3\#$.
5. Only wiring required is for power and lighting.
6. Power required - 20VA, 115V, 400 cps, 1 ϕ

Manufacturer - [redacted] 25X1

Has produced 16 units - 10, integrally lighted, for ASD, USAF. Three now being evaluated in flight tests at Randolph AFB - Design based on earlier unsatisfactory design of which 50 were built.

Att. III

Fuel Quantity System - All Attitude

Ship Status:

121 - Installed

127 - Installed and calibrated.

128 - In mod and parts available.

126, 130, and 131 - Brackets installed and ready for probes.

Probe Status:

1 Set (fourth) - Available now.

1 Set (fifth) - Available August 1.

2 sets per month after August 1.

Note: Calibration on 127 indicates all attitude systems accurate to max. error less than 1000# from 0^{o} - $7\frac{1}{2}^{o}$ nose up.

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25X1 ASD/OSA, [redacted] (27 July 1965)

Distribution:
Cy 1,2,3, - ASD/OSA
4 - D/FA/OSA
5 - OXC/OSA
6 - AD/OSA
7 - MD/OSA
8 - PS/OSA
9 - C&FE/OSA
10 - CD/OSA
11 - D/TECH/OSA
12 - chrono
13 - RB/OSA

[redacted]

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